

DEVELOPING THE 21ST-CENTURY GAS TURBINE – THE GENERAL ELECTRIC PROJECT

Description

PRIMARY PROJECT PARTNER

General Electric Company
Schenectady, NY

MAIN SITE

Schenectady, NY

TOTAL ESTIMATED COST

\$310,370,000

COST SHARING

| | |
|---------|---------------|
| DOE | \$97,570,000 |
| Non-DOE | \$212,800,000 |

General Electric Company (GE) was selected as one of two manufacturers to develop utility-scale advanced turbine systems (ATS) systems. GE developed the basic approach in FY 1993 and now has a commercially ready turbine system. GE's gas turbine system, the MS700H (or H System™), is combined with a conventional steam turbine generator in a combined-cycle power plant. This is the first gas turbine to top the 60-percent efficiency threshold – the “four minute mile” of turbine technology.

Because fuel represents the largest single cost of running a power plant, an increase of 10 percent in efficiency can reduce operating costs by as much as \$200 million over the life of a typical gas-fired 400 to 500 megawatt (MW) combined-cycle plant. These efficiency gains have been achieved because the turbine fires natural gas at 2,600 °F, nearly 300 °F hotter than conventional turbines. The turbine also operates cleaner than any of today's gas turbines. Its nitrogen oxide emission level of 9 parts-per-million (ppm) is half the average of turbines now in use, making the new technology suitable for siting in the nation's most environmentally constrained areas. The H System™ also produces the fewest tons of carbon dioxide per kilowatt of electricity of any gas turbine available today. When deployed commercially, it can make a significant contribution toward reducing greenhouse gases that can cause global warming.

Full-speed no-load testing of the H System™ was completed in FY 1999. One of the advanced turbines is being shipped to a power plant near Scriba, New York, by Sithe Energies, one of the world's largest independent power producers. The international version is scheduled to begin commercial service at the Baglan Energy Park in South Wales in 2002.

Project Duration

| | |
|--------------------|------------|
| Start Date | 09/29/1995 |
| Projected End Date | 12/31/2000 |

Project Goal

DOE's goals for utility systems include cutting nitrogen oxide emissions to less than 10 ppm, and reducing electricity costs by at least 10 percent. GE's H System™ exceeds these goals, and includes a reduction in carbon dioxide emissions.



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Benefits

Natural gas turbine systems are rapidly becoming one of the prime technologies for generating electricity. Within the next 10 to 15 years, natural gas turbines are expected to provide more than 80 percent of the new power-generating capacity added in the United States.

To ensure that the U.S. remains the world leader in turbine technology, DOE has been working with U.S. turbine manufacturers to develop an advanced, ultra-high-efficiency, environmentally superior turbine system that will produce electricity at lower cost than today's systems. GE is one of two turbine manufacturers developing large utility-scale systems (> 400 MW). These advanced turbines will play a key role in meeting the overall goals of the Vision 21 Program and providing advanced power systems for the 21st century.

Key Milestones

- | | |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FY 1999 | <ul style="list-style-type: none">• Complete MS9001H (9H, 50Hz) full-speed, no-load testing of H technology concepts• Full-scale combustor testing• Full-scale, stage-one nozzle, low-cycle fatigue testing• MS7001H (7H, 60Hz) compressor rig test |
| FY 2000 | <ul style="list-style-type: none">• Conduct full-speed, no-load test on MS7001H |



The MS700H, the size of a large locomotive, is the product of a jointly funded development effort between GE and DOE.

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PROJECT PARTNERS

GE AIRCRAFT ENGINES

Evendale, OH
Lynn, MA

GE TURBINE PLANT

Greenville, SC

GE CORPORATE RESEARCH & DEVELOPMENT

Niskayuna, NY